What is claimed is:

1. A gallium nitride-based III-V Group compound semiconductor device, comprising:

a substrate having first and second major surface;

a semiconductor stacked structure arranged over said first major surface of the substrate, and comprising an n-type gallium nitride-based III-V Group compound semiconductor layer and a p-type gallium nitride-based III-V Group compound semiconductor layer;

a first electrode provided in contact with said n-type semiconductor layer; and

a light-transmitting, second electrode provided in contact with said p-type semiconductor layer, and comprising a metallic material.

2. The device according to claim 1, wherein a light emitted from the device is observed at a side of said second major surface of the substrate.

3. The device according to claim 1, wherein said second electrode is formed of a metallic material comprising at least one metal selected from the group consisting of gold, nickel, platinum, aluminum, tin, indium, chromium and titanium.

4. The device according to claim 1, wherein said second electrode is formed of a metallic material comprising at least two metals selected from the group consisting of chromium, nickel, gold, titanium, and platinum.

5. The device according to claim 1, wherein said second electrode is formed of a metallic material comprising gold and nickel.

6. The device according to claim 5, wherein said second electrode comprises a layer of nickel provided in directly contact with said p-type electrode, and a layer of gold provided on said nickel layer.

7. The device according to claim 1, wherein said second electrode has a thickness of 0.001 μm to 1 μm.

8. The device according to claim 1, wherein said second electrode has been subjected to an annealing treatment at a temperature of 400°C or more.

9. The device according to claim 1, further comprising a lead frame supporting said device at said second major surface of the substrate.

10. The device according to claim 1, further comprising a bonding pad electrically connected to said second electrode, for bonding with a bonding wire.

11. The device according to claim 10, wherein said bonding pad is formed of gold or a metallic material comprising gold, and not containing aluminum or chromium.

12. The device according to claim 10, wherein said bonding pad is formed of a metallic material comprising gold and at least one metal selected from the group consisting of titanium, nickel, indium and platinum.

13. The device according to claim 10, wherein said

bonding pad is formed of the same metallic material forming said second electrode.

14. The device according to claim 10, wherein said bonding pad comprises a layer of nickel provided in direct contact with said second electrode, and a layer of gold provided on said nickel layer.

15. The device according to claim 10, wherein said second electrode has a cut-off portion exposing a part of the surface of said p-type semiconductor layer, and said bonding pad is filled in said cut-off portion.

16. The device according to claim 15, wherein said bonding pad is formed of a metallic material which adheres to said p-type semiconductor layer more strongly than said second electrode.

17. The device according to claim 16, wherein said bonding pad is formed of aluminum, or a metallic material comprising at least two metals selected from the group consisting of chromium, aluminum and gold.

18. The device according to claim 10, wherein said bonding pad is arranged farthest from said first electrode.

19. The device according to claim 1, comprising a protective film formed of a transparent and electrically insulative material, and covering said second electrode.

20. The device according to claim 19, wherein said protective film is formed of silicon oxide, aluminum oxide, titanium oxide, or silicon nitride.

21. The device according to claim 19, wherein said protective film also covers a surface of said first electrode.

22. The device according to claim 10, further comprising a protective film formed of a transparent and electrically insulative material, and covering said second electrode and said bonding pad.

23. The device according to claim 22, wherein said protective film is formed of silicon oxide, aluminum oxide, titanium oxide, or silicon nitride.

24. The device according to claim 22, wherein said protective film also covers said first electrode.

25. A method of producing a gallium nitride-based III-V Group compound semiconductor device, said method comprising:

providing a gallium nitride-based III-V Group compound semiconductor device structure including

a substrate having first and second major surface, and

a semiconductor stacked structure arranged over said first major surface of the substrate, and comprising an n-type gallium nitride-based III-V Group compound semiconductor layer and a p-type gallium nitride-based III-V Group compound semiconductor layer;

forming a layer of a metallic material in contact with said p-type semiconductor layer; and

subjecting said metallic material layer to

an annealing treatment to render said metallic material light-transmissive and establish an ohmic contact with said p-type semiconductor electrode, thereby providing a light-transmitting ohmic electrode in direct contact with said p-type semiconductor layer.

26. The method according to claim 25, wherein said annealing treatment is conducted at a temperature of 400°C or more.

27. The method according to claim 26, wherein said metallic material forming said ohmic electrode comprises at least one metal selected from the group consisting of gold, nickel, platinum, aluminum, tin, indium, chromium and titanium.

28. A gallium nitride-based III-V Group compound semiconductor device, comprising:

a substrate having first and second major surfaces;

a semiconductor stacked structure formed over said first major surface of the substrate, and comprising an n-type gallium nitride-based III-V Group compound semiconductor layer and a p-type gallium nitride-based III-V Group compound semiconductor layer;

a first electrode provided in contact with said n-type semiconductor layer and comprising titanium, and aluminum or gold; and

a second electrode provided in contact with said p-type semiconductor layer.

29. The device according to claim 28, wherein said

first electrode comprises a layer of titanium provided in direct contact with said n-type semiconductor layer, and a layer of aluminum or a layer of gold, provided on said titanium layer.

30. The device according to claim 28, wherein said first electrode comprised a layer of titanium provided in direct contact with said n-type semiconductor layer, a layer of aluminum provided on said titanium layer, and a layer o gold provided on said aluminum layer.

31. The device according to claim 28, wherein said first electrode comprises a first film formed of a metallic material comprising titanium and aluminum, and a second film provided on said first film and formed of a high-melting point metallic material having a melting point higher than aluminum.

32. The device according to claim 31, wherein said second film comprises titanium.

33. The device according to claim 31, wherein said second film comprises gold, and titanium and/or nickel.

34. The device according to claim 28, wherein said first electrode has been subjected to an annealing treatment at a temperature of 400°C or more.

35. The device according to claim 28, further comprising a lead frame supporting the device at said second major surface of the substrate.

36. The device according to claim 28, further comprising a bonding pad electrically connected to said

second electrode, for bonding with a bonding wire.

37. The device according to claim 36, wherein said bonding pad is arranged farthest from said first electrode.

38. The device according to claim 28, wherein said second electrode comprises nickel and gold.

39. A method of producing a gallium nitride-based III-V Group compound semiconductor device, said method comprising:

providing a gallium nitride-based III-V Group compound semiconductor device structure including

a substrate having first and second major surface, and

a semiconductor stacked structure arranged over said first major surface of the substrate, and comprising an n-type gallium nitride-based III-V Group compound semiconductor layer and a p-type gallium nitride-based III-V Group compound semiconductor layer;

forming a layer of a metallic material comprising titanium, and aluminum or gold in contact with said n-type semiconductor layer; and

subjecting said metallic material layer to an annealing treatment to establish an ohmic contact with said n-type semiconductor electrode, thereby providing an ohmic electrode in direct contact with said n-type semiconductor layer.

40. The method according to claim 39, wherein said

annealing treatment is conducted at a temperature of 400°C or more.

41. The method according to claim 40, wherein said metallic material forming said ohmic electrode comprises a layer of titanium provided in direct contact with said n-type semiconductor layer, and a layer of aluminum and/or a layer of gold, provided on said titanium layer.

42. A gallium nitride-based compound III-V Group semiconductor device, comprising:

a substrate having first and second major surfaces;

a semiconductor stacked structure arranged over said first major surface of the substrate, and comprising an n-type gallium nitride-based III-V Group compound semiconductor layer and a p-type gallium nitride-based III-V Group compound semiconductor layer;

a first ohmic electrode provided in contact with said n-type semiconductor layer, and comprising titanium, and aluminum or gold; and

a light-transmitting, second ohmic electrode provided in contact with said p-type semiconductor layer.

43. The device according to claim 42, wherein said first ohmic electrode comprises a layer of titanium provided in direct contact with said n-type semiconductor layer, a layer of aluminum provided on said titanium layer, and a layer of gold provided on said aluminum layer.

44. The device according to claim 43, wherein said

second ohmic electrode comprises a layer of nickel provided in direct contact with said p-type semiconductor layer, a layer of gold provided on said nickel layer.

45. The device according to claim 44, further comprising a bonding pad electrically connected to said second electrode, for bonding with a bonding wire.

46. The device according to claim 45, wherein said first major surface is substantially square, said bonding pad is arranged at a first corner portion of said second electrode, and said first electrode is arranged on said n-type semiconductor layer at a second corner portion thereof on a diagonal line of the square, including said first corner portion.

47. The device according to claim 46, wherein said bonding pad comprises a layer of nickel provided in direct contact with said second electrode, and a layer of gold provided on said nickel layer.

48. The device according to claim 46, wherein said second electrode has a cut-off portion exposing a portion of the surface of said p-type semiconductor layer, said bonding pad is filled in said cut-off portion, said bonding pad comprising a first layer comprising chromium or aluminum provided in direct contact with said p-type semiconductor layer, and a second layer comprising gold provided on said first layer.

49. The device according to claim 48, further comprising a transparent and electrically insulative

protective film.

50. The device according to claim 49, further comprising a lead frame supporting the device at said second major surface of the substrate.

51. The device according to claim 50, wherein a light emitted from the device is observed at a side of said second major surface of the substrate.

52. A gallium nitride-based III-V Group compound semiconductor device, comprising a gallium nitride-based III-V Group compound semiconductor layer provided over a substrate, and an electrode provided in direct contact with said semiconductor layer, said electrode comprising a metallic material, and having been annealed so as to establish an ohmic contact with the semiconductor layer.

53. The device according to claim 52, wherein said semiconductor layer is of n-type, and said metallic material comprises titanium, and aluminum or gold.

54. The device according to claim 52, wherein said semiconductor layer is of p-type, and said metallic material comprises nickel and gold.

55. The device according to claim 54, wherein said metallic material comprises a layer of nickel provided in direct contact with said semiconductor layer, and a layer of gold provided on said nickel layer.

56. The device according to claim 52, wherein said semiconductor layer is of p-type, and said electrode is light-transmissive.

57. The device according to claim 56, wherein said metallic material comprises at least one metal selected from the group consisting of gold, nickel, platinum, aluminum, tin, indium, chromium and titanium.